

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Previously Presented) An information providing apparatus for a vehicle, comprising:

a contact possibility information unit configured to determine a contact possibility of the vehicle contacting with an object that is present in front of the vehicle according to relative motion between the vehicle and the front object, the contact possibility information unit providing contact possibility information by changing at least one of the driving force and the braking force of the vehicle according to the contact possibility;

a driver intention detector configured to detect a driving intention of a driver of the vehicle, the driver intention detector detecting at least a driving intention of the driver that the driver is driving the vehicle in recognition that the possibility of the vehicle contacting the front object is increasing; and

a controller configured to modify at least one threshold for providing the contact possibility information according to a detection result provided by the driver intention detector;

wherein the controller is configured to modify the at least one threshold to delay the timing of providing the contact possibility information;

wherein the contact possibility information unit determines a contact possibility by comparing a first time derived by dividing a relative distance between the vehicle and the front object by a speed of the vehicle with a first time threshold and provides contact possibility information under a first control condition according to the determined contact possibility;

wherein the controller modifies the threshold to delay the timing of providing the contact possibility information by changing the first time threshold.

2. (Previously presented) The information providing apparatus of claim 1, wherein:

the driving intention is that the driver intentionally brings the vehicle closer to the front object when the vehicle is driven in a steady state.

3. (Previously presented) The information providing apparatus of claim 2, wherein:

the driver intention detector detects a lane change of the vehicle as the intention of the driver in intentionally bringing the vehicle closer to the front object.

4. (Previously presented) The information providing apparatus of claim 2, wherein:

the controller delays the timing of providing the contact possibility information in a case where the front object is in a lane to which the vehicle is going to change its lane.

5. (Previously presented) The information providing apparatus of claim 1, wherein:

in a case where the driver intention detector detects that the driver is intentionally bringing the vehicle closer to the front object with the vehicle in a steady driving state, the controller reduces a control value to change the driving force or braking force.

6. (Previously presented) The information providing apparatus of claim 2, wherein:

in a case where the driver intention detector detects that the driver is intentionally bringing the vehicle closer to the front object with the vehicle in a steady driving state, the controller reduces a control value to change the driving force or braking force.

7. (Previously presented) The information providing apparatus of claim 1, wherein:

the relative motion includes a relative speed between the vehicle and the front object; and

in a case where the driver intention detector detects that the driver is intentionally bringing the vehicle closer to the front object with the vehicle being in a steady driving state, the controller changes a control value of at least one of the driving force and braking force according to the relative speed.

8. (Previously presented) The information providing apparatus of claim 1, wherein the controller releases the modification after a predetermined time.

9. (Previously presented) The information providing apparatus of claim 2, wherein the controller releases the modification after a predetermined time.

10. (Previously presented) The information providing apparatus of claim 3, wherein the controller releases the modification after a predetermined time.

11. (Previously presented) The information providing apparatus of claim 4, wherein the controller releases the modification after a predetermined time.

12. (Previously presented) The information providing apparatus of claim 5, wherein the controller releases the modification after a predetermined time.

13. (Previously presented) The information providing apparatus of claim 6, wherein the controller releases the modification after a predetermined time.

14. (Previously presented) The information providing apparatus of claim 7, wherein the controller releases the modification after a predetermined time.

15. (Cancelled).

16. (Previously Presented) The information providing apparatus of claim 1, wherein:

the driving intention is determined as being that the driver intentionally brings the vehicle closer to the front object with the vehicle being driven under a steady state; and

the controller reduces a control value to change the driving force or braking force by changing the first control condition.

17. (Previously Presented) The information providing apparatus of claim 1, wherein:

the contact possibility information unit determines a contact possibility by comparing a second time derived by dividing a relative distance between the vehicle and the front object by a relative speed between the vehicle and the front object with a second time threshold and provides contact possibility information under a second control condition according to the determined contact possibility.

18. (Previously Presented) An information providing apparatus for a vehicle, comprising:

contact possibility information means for determining a contact possibility of the vehicle contacting with an object that is present in front of the vehicle according to relative motion between the vehicle and the front object, the contact possibility information

means providing contact possibility information by changing at least one of the driving force and braking force of the vehicle according to the contact possibility;

driver intention detecting means for detecting a driving intention of a driver of the vehicle, the driver intention detecting means detecting at least a driving intention of the driver that the driver is driving the vehicle in recognition that the possibility of the vehicle contacting the front object is increasing; and

controlling means for modifying at least one threshold for providing the contact possibility information according to a detection result provided by the driver intention detecting means;

wherein the controlling means is configured to modify the at least one threshold to delay the timing of providing the contact possibility information;

wherein the contact possibility information means determines a contact possibility by comparing a first time derived by dividing a relative distance between the vehicle and the front object by a speed of the vehicle with a first time threshold and provides contact possibility information under a first control condition according to the determined contact possibility;

wherein the controlling means modifies the threshold to delay the timing of providing the contact possibility information by changing the first time threshold.

19. (Previously Presented) An information providing method for a vehicle, comprising:

determining a contact possibility of the vehicle contacting with an object that is present in front of the vehicle according to relative motion between the vehicle and the front object;

detecting a driving intention of a driver of the vehicle, to detect at least a driving intention of the driver that the driver is driving the vehicle in recognition that the possibility of the vehicle contacting the front object is increasing;

calculating, according to the contact possibility, a control value to change at least one of the driving force and braking force of the vehicle; and

modifying a threshold for providing the control value according to a result of the detecting a driving intention so that timing of providing the control value is delayed;

wherein the step of determining a contact possibility comprises determining a contact possibility by comparing a first time derived by dividing a relative distance between the vehicle and the front object by a speed of the vehicle with a first time threshold and providing contact possibility information under a first control condition according to the determined contact possibility;

wherein the threshold for providing the control value is modified by changing the first time threshold.

20. (Previously Presented) An information providing apparatus for a vehicle, comprising:

a contact possibility information unit configured to determine a contact possibility of the vehicle contacting with an object that is present in front of the vehicle according to relative motion between the vehicle and the front object, the contact possibility information unit providing contact possibility information by changing at least one of the driving force and the braking force of the vehicle according to the contact possibility;

a driver intention detector configured to detect a driving intention of a driver of the vehicle, the driver intention detector detecting at least a driving intention of the driver that the driver is driving the vehicle in recognition that the possibility of the vehicle contacting the front object is increasing; and

a controller configured to modify at least one threshold for providing the contact possibility information according to a detection result provided by the driver intention detector;

wherein the controller is configured to track a predetermined amount of time when the driver intention detector detects a driving intention of the driver that the driver is

driving the vehicle in recognition that the possibility of the vehicle contacting the front object is increasing;

wherein the controller is configured to determine if the predetermined amount of time has elapsed, wherein if the predetermined amount of time has elapsed the threshold is no longer modified, and wherein if the predetermined amount of time has not elapsed the threshold remains modified;

wherein the driver intention detector detects a lane change of the vehicle as an intention of the driver in intentionally bringing the vehicle closer to the front object;

wherein the controller is further configured to determine if the object is also changing lanes after the controller determines that the predetermined amount of time has not elapsed, wherein if the object is changing lanes the threshold is not modified, and wherein if the object is not changing lanes the threshold is modified.

21. (Previously presented) The information providing apparatus of claim 20, wherein:

the controller is further configured to compare a deceleration of the object to a predetermined deceleration value after the controller determines that the predetermined amount of time has not elapsed;

wherein if the deceleration is smaller than the predetermined deceleration value a control value for at least one of the driving force and the braking force, determined according to a relative speed between the vehicle and the front object, is modified to a first value; and

wherein if the deceleration is greater than the predetermined deceleration value the control value for at least one of the driving force and the braking force, determined according to a relative speed between the vehicle and the front object, is modified to a second value.

22. (Cancelled).

23. (Previously Presented) An information providing apparatus for a vehicle, comprising:

a contact possibility information unit configured to determine a contact possibility of the vehicle contacting with an object that is present in front of the vehicle according to relative motion between the vehicle and the front object, the contact possibility information unit providing contact possibility information by changing at least one of the driving force and the braking force of the vehicle according to the contact possibility;

a driver intention detector configured to detect a driving intention of a driver of the vehicle, the driver intention detector detecting at least a driving intention of the driver that the driver is driving the vehicle in recognition that the possibility of the vehicle contacting the front object is increasing; and

a controller configured to modify at least one threshold for providing the contact possibility information according to a detection result provided by the driver intention detector;

wherein the contact possibility information unit determines a contact possibility by comparing a first time derived by dividing a relative distance between the vehicle and the front object by a speed of the vehicle with a first time threshold and provides contact possibility information under a first control condition according to the determined contact possibility;

wherein the controller modifies the threshold to delay the timing of providing the contact possibility information by changing the first time threshold;

wherein the contact possibility information unit determines a contact possibility by comparing a second time derived by dividing a relative distance between the vehicle and the front object by a relative speed between the vehicle and the front object with a second time threshold and provides contact possibility information under a second control condition according to the determined contact possibility;

wherein the controller is configured to determine the first control condition on the basis of a first virtual spring with a first spring length and a first elastic coefficient;

wherein the controller is configured to determine the first spring length on the basis of the first time threshold and the speed of the vehicle;

wherein the controller is configured to determine the second control condition on the basis of a second virtual spring with a second spring length and a second elastic coefficient;

wherein the controller is configured to determine the second spring length on the basis of the second time threshold and the relative speed; and

wherein the controller modifies at least one threshold by changing at least one of the values of the first time threshold, the first elastic coefficient, and the second elastic coefficient.

24. (Previously Presented) An information providing apparatus for a vehicle, comprising:

a contact possibility information unit configured to determine a contact possibility of the vehicle contacting with an object that is present in front of the vehicle according to relative motion between the vehicle and the front object, the contact possibility information unit providing contact possibility information by changing at least one of the driving force and the braking force of the vehicle according to the contact possibility;

a driver intention detector configured to detect a driving intention of a driver of the vehicle, the driver intention detector detecting at least a driving intention of the driver that the driver is driving the vehicle in recognition that the possibility of the vehicle contacting the front object is increasing; and

a controller configured to modify at least one threshold for providing the contact possibility information according to a detection result provided by the driver intention detector;

wherein the controller is configured to modify the at least one threshold to delay the timing of providing the contact possibility information;

wherein the apparatus employs a first virtual spring.

25. (Previously Presented) The information providing apparatus of claim 24, wherein the apparatus further employs a second virtual spring.

26. (Previously Presented) A controller for a host vehicle which has an object detecting unit that detects an object ahead of the host vehicle, the controller comprising:

a processor that is adapted to calculate a counterforce of a virtual member in front of the host vehicle which provides feedback to a driver of the host vehicle based on a relationship between the host vehicle and an object ahead of the host vehicle;

wherein the processor is configured to delay the timing of providing the feedback to the driver when an intention of the driver is detected.

27. (Previously Presented) The controller of claim 26, wherein the processor is configured to delay the timing of providing the feedback to the driver by reducing a length of the virtual member.

28. (Previously Presented) The controller of claim 26, wherein the processor is configured to delay timing of providing feedback to the driver when an intention of the driver is detected that the driver is driving the vehicle in recognition that the possibility of the vehicle contacting the object is increasing.

29. (Previously Presented) The controller of claim 26, wherein the processor delays the timing of providing contact possibility information in a case where the object is in a lane to which the vehicle is going to change its lane.

30. (Previously Presented) The controller of claim 26, wherein the processor determines a contact possibility by comparing a first time derived by dividing a relative distance between the vehicle and the object by a speed of the vehicle with a first time threshold, wherein the controller provides the feedback to the driver under a first control condition according to the determined contact possibility; and

wherein the controller delays the timing of providing the feedback to the driver by changing the first time threshold.

31. (Previously Presented) The controller of claim 30, wherein the processor determines a contact possibility by comparing a second time derived by dividing a relative distance between the vehicle and the object by a relative speed between the vehicle and the object with a second time threshold and provides the feedback to the driver under a second control condition according to the determined contact possibility.

32. (Previously Presented) A controller for an own vehicle which has an object detecting unit that detects an object ahead of the own vehicle, comprising:

a processor that is adapted to calculate a counterforce of a virtual member in front of the own vehicle which provides feedback to a driver of the own vehicle based on a relationship between the own vehicle, an object ahead of the own vehicle and an intention of the driver.

33. (Previously Presented) The controller of claim 32, wherein the processor detects a lane change of the vehicle as the intention of the driver.

34. (Previously Presented) The controller of claim 26, wherein the processor detects a lane change of the vehicle as the intention of the driver.